Job # 791286-00

OPERATION
AND
SERVICE MANUAL
T.O.S. NO. **137**

MODEL CDH-0.5
thru 2.0 MHz
PLUG-IN
HARMONIC MARKER

DEC 29 1969

telonic™
TELONIC INSTRUMENTS
A Division of Telonic Industries, Inc.
60 N. First Avenue
Beech Grove, Indiana 46107

WARRANTY

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INSTRUMENTS; Division of Telonic Industries, Inc. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble, plus the MODEL AND SERIAL NUMBERS of the unit must be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not. Contact TELONIC INSTRUMENTS at Post Office Box 87, Beech Grove, Indiana 46107 or your local TELONIC representative.

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SECTION I
GENERAL INFORMATION

1-1. SPECIFICATIONS.

1-2. Table 1-1. lists the specifications for the CDH 0.5 thru 2.0 HARMONIC MARKER.

TABLE 1-1.

Specifications	
Crystal Accuracy	± 0.005%
Frequency Range	Fundamental to 1000 MHz
Marker Width	The width of the markers depends on the marker amplifier circuitry in the sweep generator and is adjustable at the MARKER SHAPER Control on the front panel of most instruments.
Marker Amplitude and Signal to Noise Ratio	The amplitude and signal to noise ratio of the markers also depend on the sweep generator. With a typical Telonic Sweep Generator, a clear marker will be produced by these units over the entire specified frequency range. A clear marker is considered to be one with at least 0.2V peak to peak amplitude and a signal to noise ratio of at least 10 to 1.
Voltage Requirements	B+ 100V at 15mA. Filaments 6.3V at 750mA.

1-3. DESCRIPTION.

1-4. The Telonic CDH HARMONIC MARKERS are crystal-controlled plug-in units that produce birdy-type markers at the fundamental and all harmonic frequencies to 1000 MHz. These units are designed for use with Telonic Sweep Generators. The marker frequency in megahertz can be identified by the numerals following the letters CDH.

1-5. These units consist of a crystal oscillator, a harmonic generator, a mixer, and a video amplifier; all contained in one "plug-in" unit occupying two marker sockets on the Telonic Sweep Generators. The oscillator is an electron-coupled Pierce circuit with the screen grid of the 6U8 acting as the oscillator plate. The output from the oscillator is fed to a two stage harmonic generator and then to a dual diode mixer where it is combined with a signal from the sweep oscillator. The resultant heterodyne signals or "beats" are then amplified in a video amplifier and fed through a low-pass filter to the Birdy-By-Pass Amplifier in the Sweep Generator.

1-6. The crystals used in this unit are manufactured specifically for the associated oscillator circuitry. Proper allowance has been made for the capacitance of the crystal holders and other reactive properties of the oscillator section.

1-7. The dual diode mixer circuit is engineered for harmonics of nearly constant amplitude over the entire range. High order harmonics sufficiently strong for a clear marker up to 1000 MHz are available from all these units.

SECTION II

INSTALLATION

2-1. GENERAL.

2-2. This plug-in unit can be inserted in any two of the eight plug-in sockets, built-in on all Telonic Sweep Generators, that will provide a termination for the sweep sample input and output connections. The sweep sample input (BNC jack) can be fed from either one of two sweep sample lines in the sweep generator or from the sweep sample output of an adjacent plug-in unit. The sweep sample output (BNC plug) should be connected to either one of the two BNC terminators on the chassis or the sweep sample input of an adjacent box, to provide a 50 ohm matched termination.

SECTION III

MAINTENANCE

3-1. GENERAL.

3-2. Maintenance of the CDH HARMONIC MARKERS will normally be limited to replacement of component parts worn out in normal use or damaged by overload, accident, etc. Since there are no adjustable components used in this unit, the major cause of poor operation can usually be traced to a defective tube or diode.

3-3. Weak harmonic output and noise are symptoms usually indicating a defective diode. The replacement diode should have a high front to back resistance ratio if optimum results are to be realized.

3-4. In the event replacement of a crystal is necessary, it is strongly recommended that the replacement be ordered from Telonic Industries, Inc. Specified accuracy may not be realized with crystals from other sources.

3-5. To avoid electrical shock and damage to the diodes, do not remove or insert the marker unit or change any component without first turning off the unit.

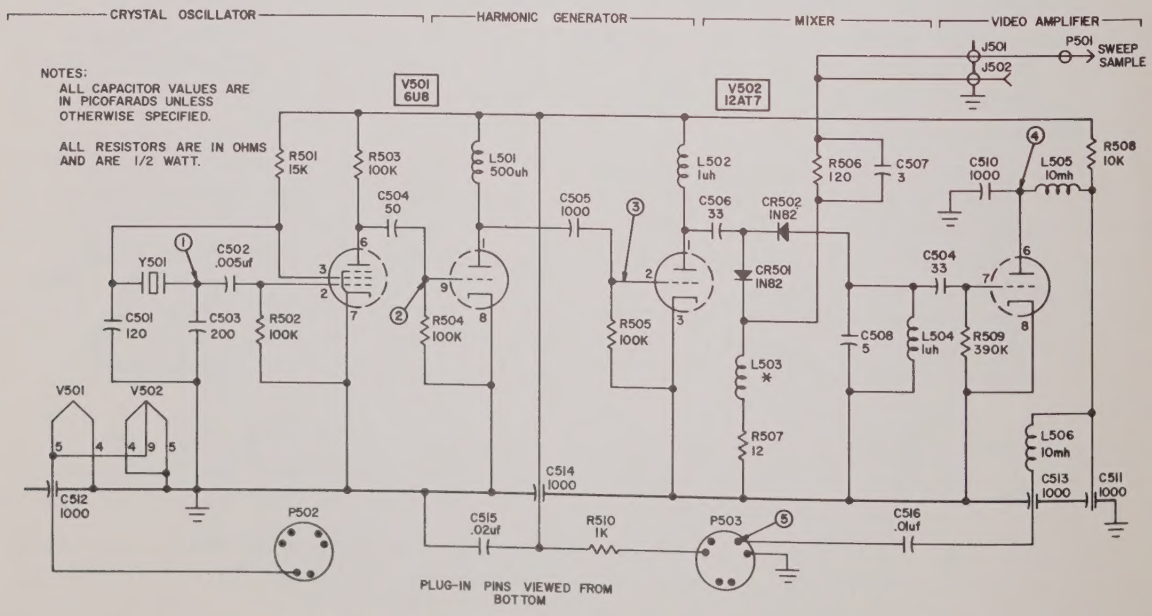
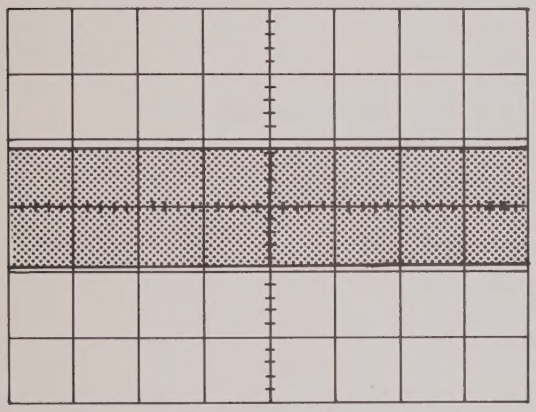


Figure 1. Schematic

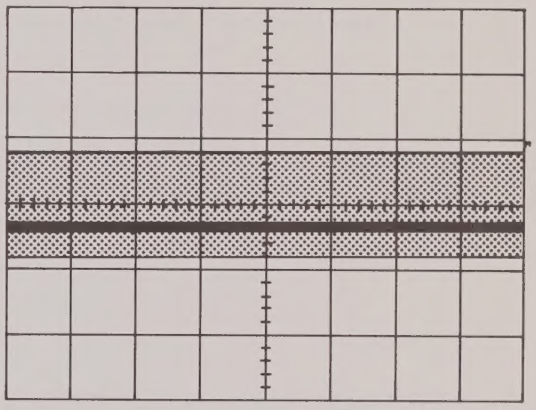
3-6. TROUBLESHOOTING (Refer to Figure 1)

3-7. Ensure that the Sweep Generator is operating properly before starting troubleshooting procedure.

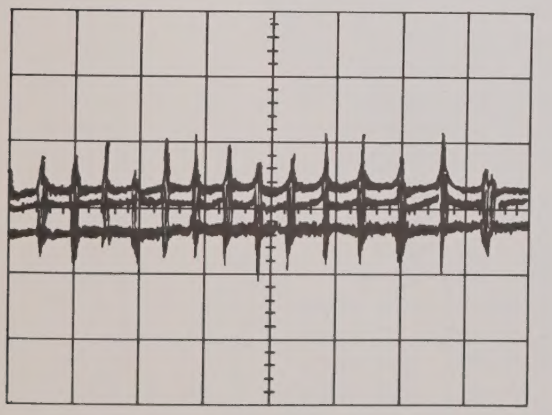
3-8. Figure 2 provides typical waveforms present at the various test points indicated on the schematic diagram.



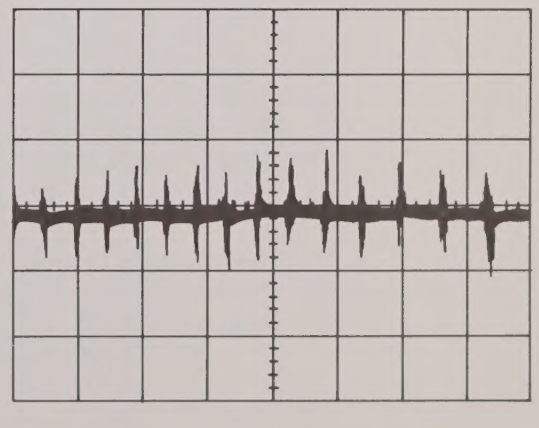
TEST POINTS 1, 2
Scale Level 0V, -30V
Vertical Sensitivity 1V/cm
Horizontal Sweep 1 msec/cm
Trigger - line



TEST POINT 3
Scale Level -40V
Vertical Sensitivity 5V/cm
Horizontal Sweep 1 msec/cm
Trigger - line



TEST POINT 4
Scale Level +68V
Vertical Sensitivity 0.005V/cm
Horizontal Sweep 1 msec/cm
Trigger - line



TEST POINT 5
Scale Level 0V
Vertical Sensitivity 0.005V/cm
Horizontal Sweep 1 msec/cm
Trigger - line

Figure 2. Waveforms

SECTION III

3-9. Adjust the Sweep Generator controls as follows:

a. SWEEP RATE - LINE
b. RF FUNCTION - SWEEP
c. MONITOR - RF 1
d. LEVEL - Adjust for 1V output
e. SWEEP WIDTH - Max Clockwise
f. 1.0 MARKER SWITCH - ON
g. POWER - ON
h. SWEEP RATIO - EQUAL
i. PLUG-IN SWEEP GENERATOR - 70MHz

NOTE

The Telonic L-5M Plug-in Sweep Generator was used to obtain the indicated waveforms.

3-10. Adjust the oscilloscope as indicated under the waveform.

SECTION IV

PARTS LIST

4-1. GENERAL

4-2. ELECTRICAL PARTS LIST. Table 4-1 provides the complete electrical parts list for the CDH-0.5 thru 2.0 HARMONIC MARKER

TABLE 4-1

Electrical Parts List

Circuit Reference No.	Description	Telonic Part No.
C501	CFC, 120pf, ±10%, 1000 VDCW	C-14
C502	CFC, 0.005uf, GMV, 600 VDCW	C-49
C503	CFC, 200pf, ±10%, 1000 VDCW	C-16
C504	CFC, 50pf, ±10%, 1000 VDCW	C-11
C505	CFC, 1000pf, GMV, 1000 VDCW	C-19
C506	CFC, 33pf, ±10%, 1000 VDCW	C-10
C507	CFN, 3pf, ±10%, 500 VDCW	C-34
C508	CFC, 5pf, ±10%, 1000 VDCW	C-4
C509	CFC, 33pf, ±10%, 1000 VDCW	C-10
C510	CFC, 1000pf, GMV, 1000 VDCW	C-19
C511	CFCF, 1000pf, +100-0%, 500 VDCW	C-110
C512	CFCF, 1000pf, +100-0%, 500 VDCW	C-110
C513	CFCF, 1000pf, +100-0%, 500 VDCW	C-110
C514	CFCF, 1000pf, +100-0%, 500 VDCW	C-110
C515	CFC, 0.02uf, +80-20%, 500 VDCW	C-21
C516	CFC, 0.01uf, +80-20%, 500 VDCW	C-20
CR501	DS, 1N82	D-1
CR502	DS, 1N82	D-1

Electrical Parts List (continued)

Circuit Reference No.	Description	Telonic Part No.
J501	TC MX1684/U	J-9
J502	RJ, UG-625/U	J-7
P501	PC, UG-88B/U	J-32
L501	IF, 500uh	L-109
L502	IF, 1 uh, ±15%	L-102
L503	Fixed, Strap	*
L504	IF, 1 uh, ±15%	L-102
L505	IF, 10mh	L-110
L506	IF, 10mh	L-110
R501	RFC, 15KΩ, ±10%, 1/2W	R-66
R502	RFC, 100KΩ, ±10%, 1/2W	R-28
R503	RFC, 100KΩ, ±10%, 1/2W	R-28
R504	RFC, 100KΩ, ±10%, 1/2W	R-28
R505	RFC, 100KΩ, ±10%, 1/2W	R-28
R506	RFC, 120KΩ, ±10%, 1/2W	R-16
R507	RFC, 12Ω, ±10%, 1/2W	R-10
R508	RFC, 10KΩ, ±10%, 1/2W	R-23
R509	RFC, 390KΩ, ±10%, 1/2W	R-72
R510	RFC, 1KΩ, ±10%, 1/2W	R-18
V501	TE 6U8	VT-8
V502	TE 12AT7	VT-10
Y501	0.5 mc for Model CDH-0.5	X-4-0.5 mc
	1.0 mc for Model CDH-1.0	X-4-1.0 mc
	Clip, diode (2 required)	S-9
P502	Plug, wafer	S-12
P503	Plug, wafer	S-12
	Shield, tube (2 required)	S-13
	Socket, tube, 9-pin (2 required)	S-8
	Socket, Quartz crystal	S-18
	Socket (mating socket for P502 and P503) (2 required) (NOT SUPPLIED)	S-11

ABBREVIATION CODE

CFC	Capacitor, fixed, ceramic
CFCF	Capacitor, fixed, ceramic feedthru
CFN	Capacitor, fixed, composition
DS	Diode, semiconductor
PC	Plug, cable
RFC	Resistor, fixed, composition
RJ	Receptacle, jack
TE	Tube, electron
TC	Terminator, cable
IF	Inductor, fixed

* No part number assigned

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